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Title: A novel reaction-analogy (RA) based scalar forcing method for direct numerical simulations of turbulence.

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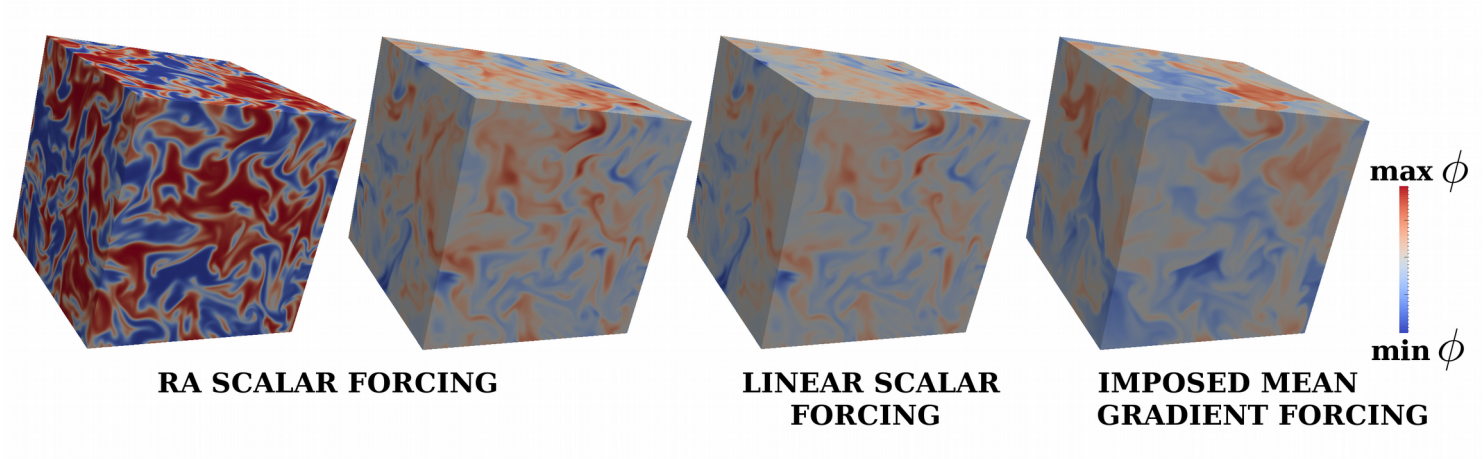
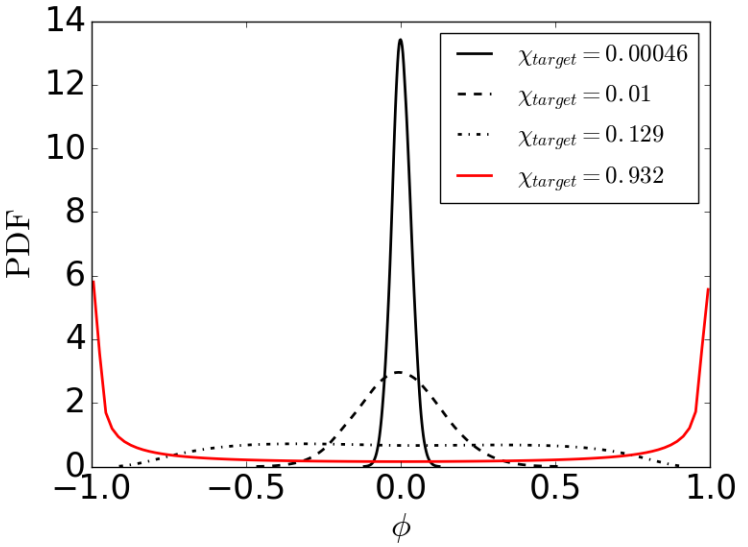
HPC Institutional Computing Report Slide
Project: w17_tvt Don Daniel, Daniel Livescu

A novel reaction-analogy (RA) based scalar forcing method for Direct Numerical Simulations of turbulence.



Highlights

1) First method capable of generating statistically steady non-Gaussian scalar turbulence (see right) along with ensuring that scalar fields remain bounded.

2) Figure above, 3D scalar fields produced by RA and current methods. RA method can either produce a large amount of pure states (red, blue) or a large amount of mixed states (white) depending on the dissipation rate. Classical methods such as linear scalar and imposed mean gradient always produce a large amount of mixed states.

3) Figure right, RA method produces different statistically stationary scalar probability density functions (PDF) based on a specified dissipation rate. For example, a dissipation of 0.932 produces a double-delta PDF (red line) while a dissipation of 0.00046 produces a stretched exponential (solid black line).